UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/797,455	03/10/2004	Mary Ann Alvin	2004P02559US	4433

7590 03/09/2009

Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, NJ 08830

EXAMINER	
YOUNG, NATASHA E	
ART UNIT	PAPER NUMBER
1797	
MAIL DATE	DELIVERY MODE
03/09/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/797,455	ALVIN ET AL.	
	Examiner	Art Unit	
	NATASHA YOUNG	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-12,14-16,18-22,24-26,28,29 and 31-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-12,14-16,18-22,24-26,28,29 and 31-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3, 5, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896) in view of Santala et al (US 3,953,176), Murrell et al (US 6,667,017 B2), Fay, III et al (US 6,040,266), and Dalla Betta et al (US 5,183,401).

Regarding claims 1 and 3, Polinski et al discloses a catalyst system comprising a first catalytic stage (20) comprising a ceramic (zircon-mullite) catalyst support (see column 7, lines 20-44) and receiving an oxidizer and a fuel (see figure 1) and discharging a partially oxidized fuel/oxidizer mixture; a second catalytic stage (26) comprising a ceramic (zircon-mullite) catalyst support (see column 7, line 60 through column 8, line 7) disposed within a pressure boundary (30, wall of structure) defining a pressure boundary cross-sectional flow area, the catalyst support receiving a first portion of the mixture, and the second catalytic stage having an outlet temperature elevated sufficiently to completely oxidize without using a separate ignition source (see column 3, line 53 through column 4, line 19); a transition stage disposed between the first catalytic stage and the second catalytic stage (38a-b), the transition stage comprises a narrowed flow area region disposed between an inlet and receiving the partially oxidized fuel/oxidizer mixture from the first catalytic stage and an outlet end discharging partially oxidized fuel/oxidizer mixture into the second catalytic stage, wherein the narrowed flow area region of the transition stage has a narrower flow area than each of the first catalytic stage and the second catalytic stage (see figures 3a-b); and the second catalytic stage having an outlet temperature elevated sufficiently to completely oxidize without using a separate ignition source and the second catalytic

stage further comprises a plurality of separate catalytic elements disposed along a flow axis of the combustor (see column 3, line 53 through column 4, line 19 and figure 2)

Polinski et al does not disclose a metallic catalyst support for the first catalytic stage and a ceramic reticulated foam catalyst support for the second catalytic stage, a bypass passageway for allowing second portion of the mixture to bypass the foam catalyst support of the second catalytic stage, and an oxidation completion stage disposed downstream of the second catalytic stage for recombining the first and second portions of the mixture and completing oxidation of the mixture and disposed downstream of the second catalytic stage for recombining the first and second portions of the mixture and completing oxidation of the mixture.

Santala et al discloses a catalytic converter having two stages made of corrugated metal strips (see Abstract; column 1, line 32 through column 2, line 33; and figure 7) and in an alternate embodiment the catalyst section (12b) are formed with a hollow cylindrical configuration by wrapping the paired corrugated catalyst strip material (32) around a metal tubing (58) (see column 7, line 5 through column 8, line 3 and figure 9).

Therefore, because their two catalytic support materials were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found obvious to substitute metal for ceramic.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the embodiment represented by figure 7 with the embodiment represented by figure 9 in order to dissipate heat through the hollow

portion of the catalyst section (12b) in which the cylindrical tubing (58) is disposed (see column 7, line 5 through column 8, line 3).

Murrell et al discloses an apparatus for the catalytic oxidation of environmentally harmful compounds (see column 1, lines 7-9) having a monolith honeycomb structure (10), a corrugated structure (12), and a corrugated structure (14) combined with a monolith structure (16) (see column 11, lines 51-65 and figures 3a-c) and that it is known in the art to have catalytic converters including metal-ceramic combustors (see column 2, lines 18-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al and Santala et al with the teachings of Murrell et al such that there is a metallic catalyst support for the first catalytic stage and a ceramic reticulated foam catalyst support for the second catalytic stage in order to further increase the conversion of NO (see Murrell et al column 11, lines 44-50).

Fay, III et al discloses the use of reticulated ceramic foam catalyst supports (see column 3, lines 18-25 and column 4, lines 4-20) and a bypass passageway disposed around a portion of a perimeter of the ceramic reticulated foam catalytic support for allowing second portion of the mixture to bypass the foam catalyst support of the second catalytic stage (see figure 8 and column 8, lines 16-28).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al, Santala et al, and Murrell et al with the teachings of Fay, III et al such that the second catalytic stage

comprises a foam catalyst support and a bypass passageway disposed around a portion of a perimeter of the ceramic reticulated foam catalytic support because it can be manufactured at low cost and provides high conversion efficiency and temperature stability (see Fay, III et al column 3, lines 18-25), in order to reduce the thermal and attachment problems that could result from the design of figure 7, and reducing catalyst foam support required as well as the amount of surface cooling/insulation material necessary (see Fay, III et al column 8, lines 5-15).

Dalla Betta et al discloses that a homogeneous combustion zone does not need to be large since the gas residence time in the zone normally should not be more than about eleven or twelve milliseconds to achieve substantially complete combustion (see column 13, lines 21-26).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al, Santala et al, Murrell et al, and Fay, III et al with the teachings of Dalla Betta et al to incorporate a homogeneous combustion zone (or oxidation completion stage) to ensure the gas that exits the second catalytic stage is in condition suitable for subsequent use, i.e., no NOx (see Dalla Betta et al column 12, line 66 through column 13, line 10).

Regarding claim 5, Polinski et al discloses a donut-shaped cross-section (see figure 2).

Fay, III et al discloses the use of reticulated ceramic foam catalyst supports (see column 3, lines 18-25 and column 4, lines 4-20) and a bypass passageway disposed around a portion of a perimeter of the ceramic reticulated foam catalytic support for

allowing second portion of the mixture to bypass the foam catalyst support of the second catalytic stage (see figure 8 and column 8, lines 16-28) which result in a donut-shaped cross-section.

Regarding claim 34, Polinski et al discloses that the catalyst system is constricted at element 38a and baffles 39 are provided to reduce radiant heat (see column 5, lines 36-46), which results in substantially limiting combustion of the partially oxidized fuel/oxidizer mixture from the first catalytic stage.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Santala et al (US 3,953,176), Murrell et al (US 6,667,017 B2), Fay, III et al (US 6,040,266), and Dalla Betta et al (US 5,183,401) as applied to claim 1 above, and further in view of Spadaccini et al (US 5,207,053).

Regarding claim 2, Polinski et al does not disclose a catalytic combustor wherein the second catalytic stage further comprises a catalytic material selected from the group consisting of perovskite, zeolite, and hexaaluminate.

Spadaccini et al discloses that catalysts used for combustion of fuel for turbine include precious metal catalyst such as platinum and palladium and zeolites (see column 5, lines 3-7).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Polinski et al, Santala et al, Murrell et al, Fay, III et al, Dalla Betta et al, and Butler et al with the teachings of Spadaccini et al to benefit from the properties of the zeolites including being more reactive and producing

more unsaturated products than precious metal catalysts (see Spadaccini et al column 5, lines 30-33).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Santala et al (US 3,953,176), Murrell et al (US 6,667,017 B2), Fay, III et al (US 6,040,266), and Dalla Betta et al (US 5,183,401) as applied to claim 1 above, and further in view of Steenackers et al (US 5,645,803).

Regarding claim 4, Polinski et al does not disclose a catalytic combustor wherein the ceramic reticulated foam catalytic support comprises a cruciform cross-section.

However, Polinski et al discloses ceramic honeycomb catalyst support (see Figure 2 and column 7, line 20 through column 8, line 7).

Steenackers et al discloses cruciform-shaped honeycomb structure made from metal sheets (see Abstract and figures 16-20).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al, Santala et al, Murrell et al, Fay, III et al, Dalla Betta et al, and Butler et al with the teachings of Steenackers et al to construct bypass passageways for allowing a portion of the fuel-air mixture to bypass the foam catalytic support of the second catalytic stage.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Santala et al (US 3,953,176), Murrell et al (US 6,667,017 B2), Fay, III et al (US 6,040,266), and Dalla Betta et al (US 5,183,401) as applied to claim 1 above, and further in view of Butler et al (RMRS-RP-9).

Regarding claim 32, Polinski et al discloses a catalyst system comprising a narrowed flow region.

Butler et al defines the Venturi effect as the increase in velocity of a stream of gas or liquid as it passes from one area through another area of smaller size or diameter. Since Polinski et al discloses a stream of gas or liquid as it passes from one area through another area of smaller size or diameter, the transition stage to the second catalytic stage generates a Venturi effect.

Claims 6, 9, 16, 18, 20-21, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896) in view of Leloup et al (US 2002/0076372 A1) and Dalla Betta et al (US 5,183,401).

Regarding claim 6, Polinski et al discloses a catalyst system comprising a first catalytic stage (20) comprising a ceramic (zircon-mullite) catalyst support (see column 7, lines 20-44) and receiving an oxidizer and a fuel (see figure 1) and discharging a partially oxidized fuel/oxidizer mixture; a second catalytic stage (26) comprising a ceramic (zircon-mullite) catalyst support (see column 7, line 60 through column 8, line 7); and the second catalytic stage having an outlet temperature elevated sufficiently to completely oxidize without using a separate ignition source and the second catalytic stage further comprises a plurality of separate catalytic elements disposed along a flow axis of the combustor (see column 3, line 53 through column 4, line 19 and figure 2)

Polinski et al does not disclose the second catalytic stage comprising a bypass passageway for conducting a bypass portion of the partially oxidized fuel/oxidizer mixture past a catalyst disposed therein, each of the plurality of separate catalytic

elements comprising an identical cross-section and being misaligned and axially rotated about the flow axis with respect to an adjacent catalytic element effective to cause mixing of a flow about the flow axis, and an oxidation completion stage disposed downstream of the second catalytic stage for recombining the first and second portions of the mixture and completing oxidation of the mixture and disposed downstream of the second catalytic stage for recombining the first and second portions of the mixture and completing oxidation of the mixture.

Leloup et al discloses each of the plurality of separate catalytic elements comprising an identical cross-section and being misaligned and axially rotated about the flow axis with respect to an adjacent catalytic element effective to cause mixing of a flow about the flow axis (see Abstract and figures 3-5)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al with the teachings of Leloup et al such that each of the plurality of separate catalytic elements comprising an identical cross-section and being misaligned and axially rotated about the flow axis with respect to an adjacent catalytic element effective to cause mixing of a flow about the flow axis in order to increase the catalytic efficiency of the reactor (see Abstract).

Dalla Betta et al discloses that a homogeneous combustion zone does not need to be large since the gas residence time in the zone normally should not be more than about eleven or twelve milliseconds to achieve substantially complete combustion (see column 13, lines 21-26).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al and Leloup et al with the teachings of Dalla Betta et al to incorporate a homogeneous combustion zone (or oxidation completion stage) to ensure the gas that exits the second catalytic stage is in condition suitable for subsequent use, i.e., no NOx (see Dalla Betta et al column 12, line 66 through column 13, line 10).

Regarding claim 9, Polinski et al does not disclose wherein the second catalytic stage further comprises a first region comprising a first catalytic material, and a second region disposed downstream of the first region and comprising a second catalytic material different from the first catalytic material.

Dalla Betta et al discloses the second catalytic stage further comprises a first region comprising a first catalytic material, and a second region disposed downstream of the first region and comprising a second catalytic material different from the first catalytic material (see column 10, 2nd and 4th paragraphs).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Polinski et al with the teachings of Dalla Betta et al to incorporate a homogeneous combustion zone (or oxidation completion stage) to ensure the gas that exits the second catalytic stage is in condition suitable for subsequent use, i.e., no NOx (see Dalla Betta et al column 12, line 66 through column 13, line 10).

Regarding claim 16, Polinski et al does not disclose the separate catalytic elements comprise different catalytic materials.

Dalla Betta et al discloses the separate catalytic elements comprise different catalytic material (see column 10, 2nd paragraph and column 11, 2nd and 4t" paragraphs).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al and Leloup et al with the teachings of Dalla Betta et al to produce working gas which contains substantially no NOx and is at a temperature comparable to normal combustion process without shortening the useful life of the catalyst and its support (see column 14, lines 5-12).

Regarding claim 18, Polinski et al discloses each catalytic element is spaced apart from an adjacent catalytic element along the flow axis (see figure 2).

Regarding claim 20, Polinski et al discloses a disk (24) in the second catalytic stage (see figure 2).

Polinski et al does not disclose the second catalytic stage further comprises a plurality of catalytic material coated plates defining longitudinal passageways.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have multiple disks (24) or multiple sets of the disk (24) and annular ring (22), since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art (see MPEP 2144.04 (VI-B)).

Regarding claim 21, Polinski et al discloses the second catalytic stage further comprises a catalyst support selected from the group consisting of a honeycomb structure, a tower packing structure, and a packed particle structure (see figures 1-2).

Regarding claim 35, Polinski et al discloses that the catalyst system is constricted at element 38a and baffles 39 are provided to reduce radiant heat (see column 5, lines 36-46), which results in substantially limiting combustion of the partially oxidized fuel/oxidizer mixture from the first catalytic stage.

Claims 8 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Leloup et al (US 2002/0076372 A1), and Dalla Betta et al (US 5,183,401) as applied to claim 6 above, and further in view of Spadaccini et al (US 5,207,053).

Regarding claim 8, Polinski et al does not disclose a catalytic combustor wherein the second catalytic stage further comprises a catalytic material selected from the group consisting of perovskite, zeolite, and hexaaluminate.

Spadaccini et al discloses that catalysts used for combustion of fuel for turbine include precious metal catalyst such as platinum and palladium and zeolites (see column 5, lines 3-7).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Polinski et al, Leloup et al, and Dalla Bella et al with the teachings of Spadaccini et al to benefit from the properties of the zeolites including being more reactive and producing more unsaturated products than precious metal catalysts (see Spadaccini et al column 5, lines 30-33).

Regarding claim 22, Polinski et al does not disclose a combustor wherein the first catalytic stage comprises a rich catalytic stage.

Spadaccini et al discloses that in a rich catalytic stage thermal energy is transferred from a heat source to an endothermic decomposition catalyst, thereby cooling the heat source and heating the catalyst to a temperature sufficient to endothermically decompose an endothermic fuel (see column 3, lines 1-20).

Polinski et al discloses a catalyst system which uses cooling air to cool the first catalytic stage (see figure 2) and different catalyst compositions in each of the catalyst portions may be used (see column 6, lines 56-67).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use heated air to heat the first catalytic stage such that a staged rich/lean combustion system may be constructed, since it was known in the art that if a stage can be cooled it can also be heated.

Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Leloup et al (US 2002/0076372 A1), and Dalla Betta et al (US 5,183,401) as applied to claim 6 above, and further in view of Murrell et al (US 6,667,017 B2).

Regarding claim 10, Polinski et al does not disclose a first catalytic material disposed on a metallic support in the first catalytic stage; and a second catalytic material, different from the first catalytic material, disposed on a ceramic support in the second catalytic stage.

Murrell et al discloses an apparatus for the catalytic oxidation of environmentally harmful compounds (see column 1, lines 7-9) having a monolith honeycomb structure (10), a corrugated structure (12), and a corrugated structure (14) combined with a

monolith structure (16) (see column 11, lines 51-65 and figures 3a-c) and that it is known in the art to have catalytic converters including metal-ceramic combustors (see column 2, lines 18-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al, Leloup et al, and Dalla Bella et al with the of Murrell et al such that a metallic catalyst support for the first catalytic stage and a ceramic reticulated foam catalyst support for the second catalytic stage in order to further increase the conversion of NO (see Murrell et al column 11, lines 44-50).

Regarding claim 11, Polinski et al does not disclose the second catalytic stage further comprises a metallic support comprising a metal alloy selected from the group consisting of molybdenum disilicide, iron-chromium-aluminum, and iron aluminide.

Murrell et al discloses an apparatus for the catalytic oxidation of environmentally harmful compounds (see column 1, lines 7-9) having a monolith honeycomb structure (10), a corrugated structure (12), and a corrugated structure (14) combined with a monolith structure (16) (see column 11, lines 51-65 and figures 3a-c) and that it is known in the art to have catalytic converters including metal-ceramic combustors (see column 2, lines 18-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a metallic support comprising a metal alloy selected from the group consisting of molybdenum disilicide, iron-chromium-aluminum, and iron aluminide, since it has been held to within the general skill of a worker in the art to

select a known material on the basis of its suitability for the intended use as a material of obvious design choice.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al, Leloup et al, and Dalla Bella et al with the of Murrell et al such that a metallic catalyst support for the first catalytic stage and a ceramic reticulated foam catalyst support for the second catalytic stage in order to further increase the conversion of NO (see Murrell et al column 11, lines 44-50).

Claims 12, 14, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Leloup et al (US 2002/0076372 A1), and Dalla Betta et al (US 5,183,401) as applied to claim 6 above, and further in view of Fay, III et al (US 6,040,266).

Regarding claim 12, Polinski et al does not disclose the second catalytic stage further comprises a catalytic material disposed on a ceramic reticulated foam catalyst support.

Polinski et al discloses the second catalytic stage comprising a catalytic material disposed on the ceramic catalyst support (see column 7, line 61 through column 8, line 7).

Fay, III et al discloses the use of reticulated ceramic foam catalyst supports (see column 3, lines 18-25 and column 4, lines 4-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Polinski et al, Leloup et al, and Dalla

Bella et al with the teachings of Fay, III et al such that the second catalytic stage further comprises a catalytic material disposed on a ceramic reticulated foam catalyst support because reticulated ceramic foam catalyst supports are capable of extended high temperature operation and provide for both exhaust conversion and sound suppression in the same unit (see Fay, III et al column 3, lines 57-62).

Regarding claim 14, Polinski et al does not disclose the separate catalytic elements comprise ceramic reticulated foam catalyst supports comprising different pore size grades.

Fay, III et al discloses the use of reticulated ceramic foam catalyst supports (see column 3, lines 18-25 and column 4, lines 4-20). The ceramic structure is porous with pore densities from 10-1000 ppi (see column 4, line 46 and lines 51-54), which implies different pore size grades.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Polinski et al, Leloup et al, and Dalla Bella et al with the teachings of Fay, III et al such that the separate catalytic elements comprise ceramic reticulated foam catalyst supports comprising different pore size grades because reticulated ceramic foam catalyst supports are capable of extended high temperature operation and provide for both exhaust conversion and sound suppression in the same unit (see Fay, III et al column 3, lines 57-62).

Regarding claim 19, Polinski et al does not disclose the second stage further comprises a tubular catalyst support coated with a catalytic material on an outside surface and an inside surface.

Fay, III et al discloses the use of reticulated ceramic foam catalyst supports (see column 3, lines 18-25 and column 4, lines 4-20), a bypass passageway disposed around a portion of a perimeter of the ceramic reticulated foam catalytic support for allowing second portion of the mixture to bypass the foam catalyst support of the second catalytic stage (see figure 8 and column 8, lines 16-28), and the catalyst is located solely on the support surface (see column 3, lines 41-56) such that a tubular catalyst support coated with a catalytic material on an outside surface and an inside surface.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al, Leloup et al, and Dalla Bella et al with the teachings of Fay, III et al such that the second catalytic stage comprises a tubular catalyst support coated with a catalytic material on an outside surface and an inside surface because it can be manufactured at low cost and provides high conversion efficiency and temperature stability (see Fay, III et al column 3, lines 18-25) and in order to reduce the thermal and attachment problems that could result from the design of figure 7. It also reduces the catalyst foam support required as well as the amount of surface cooling/insulation material necessary (see Fay, III et al column 8, lines 5-15), and enhances catalytic efficiency (see Fay, III et al column 3, line 41-56).

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Leloup et al (US 2002/0076372 A1), and Dalla Betta et al (US 5,183,401) as applied to claim 6 above, and further in view of Butler et al (RMRS-RP-9).

Regarding claim 33, Polinski et al discloses a catalyst system comprising a narrowed flow region.

Butler et al defines the Venturi effect as the increase in velocity of a stream of gas or liquid as it passes from one area through another area of smaller size or diameter. Since Polinski et al discloses a stream of gas or liquid as it passes from one area through another area of smaller size or diameter, the transition stage to the second catalytic stage generates a Venturi effect.

Claims 24-26, 29, 31, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896) in view of Fay, III et al (US 6,040,266), Butler et al (RMRS-RP-9), and Lywood (US 5,228,847).

Regarding claim 24, Polinski et al discloses catalyst system comprising: an upstream pressure boundary (20) comprising a catalytic surface disposed therein for receiving a fuel/oxidizer mixture (see figure 1) and discharging a partially oxidized fuel/oxidizer mixture; a downstream pressure boundary (26) defining a pressure boundary cross-sectional flow area for receiving the partially oxidized fuel/oxidizer mixture; a ceramic catalyst support disposed within the second pressure boundary for receiving a first portion of the mixture (see column 7, line 60 through column 8, line 7); and a transition pressure boundary (38a-b) disposed between the upstream pressure boundary and the downstream pressure boundary, the transition pressure boundary comprising a narrowed flow area region (see figure 3a-b) effective to generate a venturi effect disposed between an inlet end receiving the oxidized fuel/oxidizer mixture from the upstream pressure boundary and an outlet end discharging the partially oxidized

fuel/oxidizer mixture into the downstream pressure boundary, wherein the transition pressure boundary is configured to substantially limit combustion of the partially oxidized fuel/oxidizer mixture from the upstream pressure boundary.

Butler et al defines the Venturi effect as the increase in velocity of a stream of gas or liquid as it passes from one area through another area of smaller size or diameter. Since Polinski et al discloses a stream of gas or liquid as it passes from one area through another area of smaller size or diameter, the transition stage to the second catalytic stage generates a Venturi effect.

Polinski et al does not disclose a catalyst-coated reticulated foam support; presenting a support cross-sectional flow area less than the second pressure boundary cross- sectional flow area to define a bypass passageway for allowing a second portion of the fuel/oxidizer mixture to bypass the foam support; wherein the bypass passageway is disposed around a portion of an outer perimeter of the reticulated foam support; and wherein the reticulated foam support comprises a cross-section perimeter smaller than an internal perimeter of the pressure boundary, the foam support supported against the internal perimeter by spaced apart standoffs comprising the reticulated foam support.

Fay, III et al discloses the use of reticulated ceramic foam catalyst supports (see column 3, lines 18-25 and column 4, lines 4-20) and a bypass passageway for allowing second portion of the mixture to bypass the foam catalyst support of the second catalytic stage (see figure 8 and column 8, lines 16-28) such that the bypass passageway is disposed around a portion of an outer perimeter of the reticulated foam

support and the reticulated foam support comprises a cross-section perimeter smaller than an internal perimeter of the pressure boundary.

Fay, III et al does not explicitly disclose that the foam support is supported against the internal perimeter by spaced apart standoffs.

However, Fay, III et al appears to be supported in figure 8.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al and Butler et al with the teachings of Fay, III et al such that the second catalytic stage comprises a foam catalyst support because it can be manufactured at low cost and provides high conversion efficiency and temperature stability (see Fay, III et al column 3, lines 18-25) and in order to reduce the thermal and attachment problems that could result from the design of figure 7, reduction of catalyst foam support required as well as the amount of surface cooling/insulation material necessary (see Fay, III et al column 8, lines 5-15).

Lywood et al discloses using a catalyst body, which provides outer annular bypass regions (see column 7, lines 25-32 and figure 3), thus providing a cross-section perimeter smaller than an internal perimeter of the pressure boundary, the foam support being supported against the internal perimeter by spaced apart standoffs (39).

It would have been obvious to one having ordinary skill in the art at time the invention was made to modify the combined teachings of Polinski et al, Fay, III et al, and Butler et al with the teachings of Lywood et al such that the foam support is supported against the internal perimeter by spaced apart standoffs in order to support the catalyst support.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the foam support supported against the internal perimeter by spaced apart standoffs comprising the reticulated foam support, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In addition, using the reticulated foam as the material of the standoffs increases the surface of catalyst exposure.

Regarding claim 25, Polinski et al does not disclose a catalytic combustor wherein the reticulated foam support comprises a cross-section sized to bypass from 25% to 80% of the mixture past the foam support element.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a cross-section sized to bypass from 25% to 80% of the mixture past the foam support element, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 (II-A).

Regarding claim 26, Polinski et al discloses a catalytic system wherein the reticulated foam support defines a plurality of separate passageways within the pressure boundary (see figure 2).

Regarding claim 29, Polinski et al discloses a donut-shaped cross-section (see figure 2).

Regarding claim 31, Polinski et al discloses a ceramic catalyst support (see column 7, line 61 through column 8, line 7).

Regarding claim 36, Polinski et al discloses a transition pressure boundary disposed between the upstream pressure boundary and the downstream pressure boundary disposed between an inlet end receiving the partially oxidized fuel/oxidizer mixture from the upstream pressure boundary and an outlet end discharging the partially oxidized fuel/oxidizer mixture into the downstream pressure boundary (see column 7, line 60 through column 8, line 7); and a transition pressure boundary (38a-b) disposed between the upstream pressure boundary and the downstream pressure boundary, the transition pressure boundary comprising a narrowed flow area region (see figure 3a-b) effective to generate a venturi effect disposed between an inlet end receiving the oxidized fuel/oxidizer mixture from the upstream pressure boundary and an outlet end discharging the partially oxidized fuel/oxidizer mixture into the downstream pressure boundary, wherein the transition pressure boundary is configured to substantially limit combustion of the partially oxidized fuel/oxidizer mixture from the upstream pressure boundary.

Butler et al defines the Venturi effect as the increase in velocity of a stream of gas or liquid as it passes from one area through another area of smaller size or diameter. Since Polinski et al discloses a stream of gas or liquid as it passes from one area through another area of smaller size or diameter, the transition stage to the second catalytic stage generates a Venturi effect.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Fay, III et al (US 6,040,266), Butler et al (RMRS-RP-9), and

Lywood (US 5,228,847) as applied to claim 24 above, and further in view of Steenackers et al (US 5,645,803).

Regarding claim 28, Polinski et al does not disclose a catalytic combustor wherein the ceramic reticulated foam catalytic support comprises a cruciform cross-section.

However, Polinski et al discloses ceramic honeycomb catalyst support (see Figure 2 and column 7, line 20 through column 8, line 7).

Steenackers et al discloses cruciform-shaped honeycomb structure made from metal sheets (see Abstract and figures 16-20).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al, Fay, III et al, Butler et al, and Lywood with the teachings of Steenackers et al to construct bypass passageways for allowing a portion of the fuel-air mixture to bypass the foam catalytic support of the second catalytic stage.

Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polinski et al (US 4,270,896), Fay, III et al (US 6,040,266), Butler et al (RMRS-RP-9), and Lywood (US 5,228,847) as applied to claim 24 above, and further in view of Leloup et al (US 2002/0076372 A1).

Regarding claim 37, Polinki does not disclose a catalytic combustor further comprising a plurality of additional bypass passageways for allowing the second portion of the fuel/oxidizer mixture to bypass the foam support, wherein said plurality of

additional bypass passageways comprises a plurality of spaced apart, tubular passageways.

Fay, III et al discloses the use of reticulated ceramic foam catalyst supports (see column 3, lines 18-25 and column 4, lines 4-20) and a bypass passageway for allowing the second portion of the fuel/oxidizer mixture to bypass the foam support (see figure 8 and column 8, lines 16-28).

Leloup et al discloses that it is known in the art to have a spacing interval or chamber (16) within enclosure (14) between catalysts (12a-b) (see paragraph 0034 and figure 2).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the combined teachings of Polinski et al, Fay, III et al, Butler et al, and Lywood with the teachings of Leloup et al such that a plurality of catalyst supports are spaced apart resulting in a plurality of additional bypass passageways for allowing the second portion of the fuel/oxidizer mixture to bypass the foam support, wherein said plurality of additional bypass passageways comprises a plurality of spaced apart, tubular passageways in order to promote extensive mixing and redistribution of feed stream reactants and partial products entering the chamber prior to further processing in downstream catalyst or other treatment sections of the reactor (see paragraph 0035).

Response to Arguments

Applicant's arguments filed January 12, 2009 have been fully considered but they are not persuasive.

The applicants argue that Santala et al does not disclose "a ceramic reticulated foam catalyst support".

The examiner agrees; however, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references.

The applicants submit that the examiner's five-way combination of references to reject independent claim 1 fails because it is readily apparent that one skilled in the art would not have been prompted to modify the teachings of Polinki et al, Murrell et al, Fay, III et al and/or Dalla Betta et al with the teachings of Santala et la to arrive at the claimed invention.

The examiner disagrees since all references disclose catalytic environments or catalyst to be used therein.

Applicants argue that there is not rational reasoning that exists because Santala et al does not describe the alleged interchangeable material as contended by the examiner.

The examiner disagrees.

The examiner never alleged that Santala et al disclose interchangeable material.

The examiner stated that Polinki et al disclosed a ceramic catalytic support and Santala et al discloses a metallic catalytic support. Both references disclose similar catalyst systems, for example Polinki et al, figure 3A and Santala et al, figure 7, the

catalytic support are seen as art-recognized equivalents at the time the invention was made such that one of ordinary skill in the art would have found it obvious to substitute a metallic catalyst support for a ceramic catalyst support.

The applicants argue that Murrell et al merely discloses the combination of two different materials, but do not disclose a "plurality of separate catalytic elements disposed along a flow axis of the combustor, each of the plurality of separate catalytic elements comprising an identical cross-section and being misaligned and axially rotated about the flow axis with respect to an adjacent catalytic element effective to cause mixing of a flow about the flow axis.

Applicant's arguments, see Remarks, pages 12-13 and 14, filed January 12, 2009, with respect to the rejection(s) of claim(s) 6 under U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Leloup et al (US 2002/0076372 A1).

Applicants argue that Lywood fails to disclose "spaced apart standoffs comprising the reticulated foam support".

The examiner agrees; however, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATASHA YOUNG whose telephone number is 571-270-3163. The examiner can normally be reached on Mon-Thurs 7:30 am-6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Walter D. Griffin/
Supervisory Patent Examiner,
Art Unit 1797

/N. Y./
Examiner, Art Unit 1797